Brood Size Factors in Masked Boobies

by Jeffrey H. Simonson

Unlike terrestrial birds, most seabirds produce only one chick in a breeding cycle. Moreover, some of these seabird species do so from a clutch of two eggs. The second chick hatches later than the first and is eliminated from the nest by the larger sibling; this is obligate siblicide. Previously, the parental food delivery limitation was used to explain this behavior. However, siblicide driven by genetic parent-offspring conflict (POC) has also been proposed to limit brood size. In his study of masked boobies (Sula dactylatra), Anderson (1990) purports to determine whether single-chick brood size is a function of food limitation, POC, or a combination of both. To test this idea, Anderson experimentally suppressed obligate siblicide in the S. dactylatra breeding colony at Punta Cevallos, Isla Española in the Galápagos Islands. In 15 of 278 nests, doubled broods were created by introducing an unrelated, first-hatching chick of similar age and size into an occupied nest. Any ejected chicks in these experimental broods were replaced back into the nest by the observers. To equilibrate dominance do due weight differences, the heavier chick was removed from the nest each day during peak feeding until chick weights were similar. Chicks were weighed at 4-hr intervals to determine daily food intake. Weights of chicks in singleton broods were higher than doublets until fledging when the weights converged. Though parents of doubled broods spent no more time foraging than parents of singletons, they were able to feed both chicks. Chick mortality in doublet broods was significantly higher than singletons. Attacks by non-breeding adults were the primary cause of singleton mortality; doublets died as a result of sibling aggression and poor physical condition. Doublet broods, however, experienced a higher fledgling rate than singleton broods despite the higher mortality. Furthermore, fitness of these doublets was higher than singletons. The results of Anderson's study supports neither proposed hypotheses. Brood size is not limited by parental food delivery; parents can successfully feed two chicks. Additionally, high fledging rates of doublet broods where siblicide was suppressed contradicts the hypothesis that POC limits brood size. In other words, neither of the two hypotheses explain why masked boobies always fledge one chick. Anderson explains this failure of the POC hypothesis by suggesting development of alternate behavior is unfavorable because of the high risk of sharing the nest with a siblicidal nest mate. Anderson has presented a unique study. His methods were simple and easy to understand. The results strongly refute the long held idea of food limitation causing single chick broods. The hypothesis of POC being the cause, however, is also unsupported. Anderson, though, suggests reasonable explanations for the later discrepancy. Furthermore, he lists objections to his study raised by other researchers and offers remedies for these problems. This openness is indeed unusual.

Literature Cited

Anderson, David J. 1990. Evolution of obligate siblicide in boobies. 2: Food limitation and parent-offspring conflict. Evolution 44(8):2069-2082.